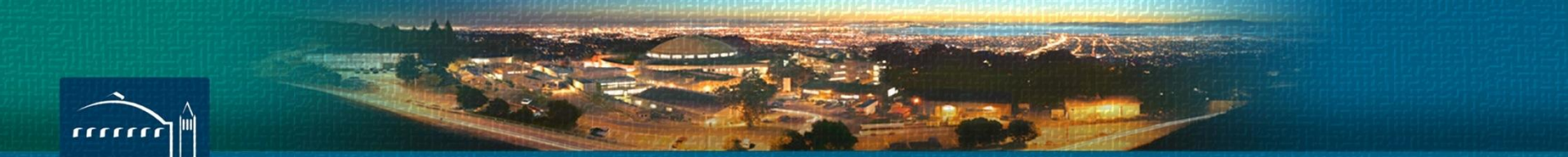


Technical Working Group Meeting # 8

July 17, 2014

Via Phone/ReadyTalk

Table of Contents

Mapping Example

Implementation Field Name	BEDES Term	BEDES Mapping
Lot Number	Identifier Label	="Tax Map Number"
	Identifier Value	=[value]
Gross Floor Area	Floor Area Type	="Gross"
	Floor Area Value	=[value]
Occupied Floor Area	Floor Area Type	="Occupied"
	Floor Area Value	=[value]
Site EUI	Site Energy Use Intensity (EUI)	=[value]
	Resource	="Combination"
	End Use	="Whole building"
	Interval Frequency	="Annually"

- Multiple BEDES terms may be needed to fully define a field in an implementation.
- The use of cell merge in Excel captures the mapping for each field.

Overview of Module 2 – Schedule

Posted Module 2, Part 1 Drafts	July 13
Module 2 Technical Working Group Call	July 17
Forum Postings/ Feedback	July - August
Module 2, Part 2 Draft for Review	Mid-August
Forum Postings/ Feedback	August –September
Final Review Technical Working Group Bi-Coastal Meeting	September 8
Final release of 1.0	September 30

Overview of Module 2 – Areas Covered

BERKELEY LAB

Part 1

1. Envelope
2. Controls and Operations
3. Energy Generation and Storage
4. Measures

Part 2

1. HVAC
2. Process Loads
3. Internal Equipment Loads

Module 2 – Providing Feedback

- Forum
  - Topics are posted, members can post replies
  - Members can add new topics
- Email BEDES-TWG@lbl.gov
  - All Forum members receive the email
- Add Comments to Spreadsheet
  - Everyone is looking / commenting on the same doc
  - How to add comments
- Email Robin (RDMitchell@lbl.gov)

Envelope

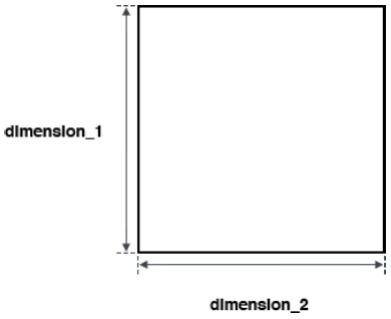
- Complexity – BEDES needs to cover all levels
  - Simple
    - BPD
  - Moderately complex
    - AIA
    - AUC
    - HPXML
    - IEP
  - Complete enough to do a simulation
    - CAST
    - HES (SF)

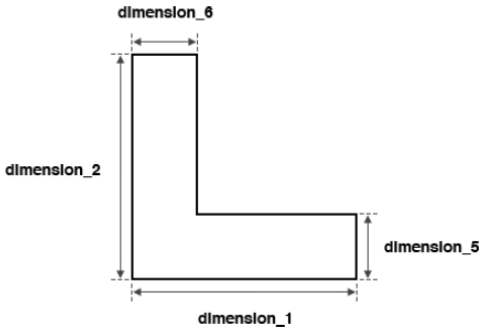
Envelope

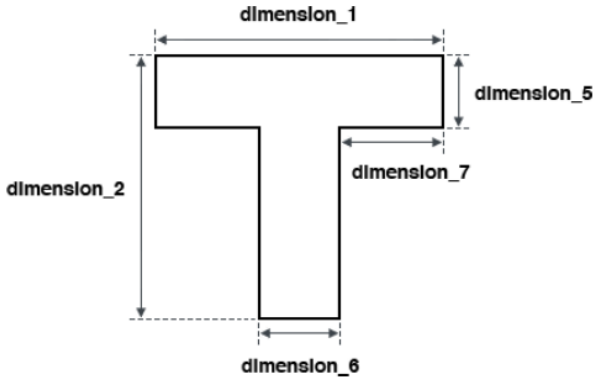
- Building Geometry
  - Enough detail to be useful
- Surfaces
  - Walls, Roof, Floor relative (or not) to the geometry
- Construction of surfaces
  - Insulation level
- Fenestration
- Shading

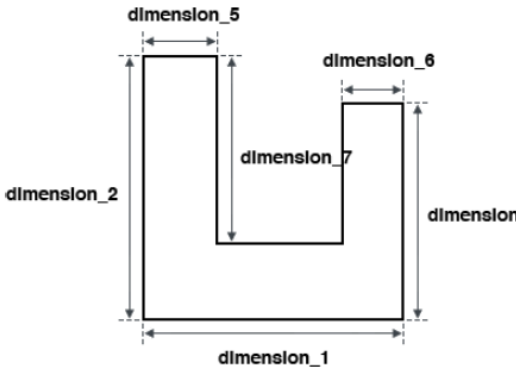
Envelope: Building Geometry

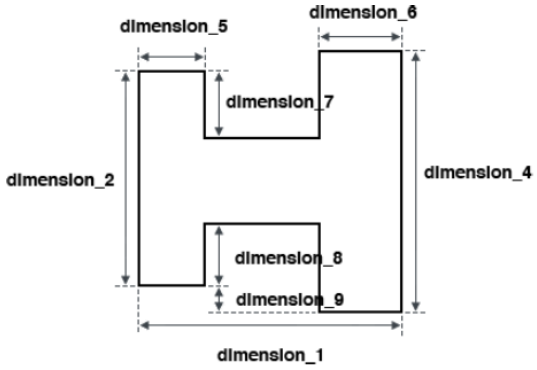
- **Building Footprint**
  - Dimension
  - Assigning dimensions is implementation specific

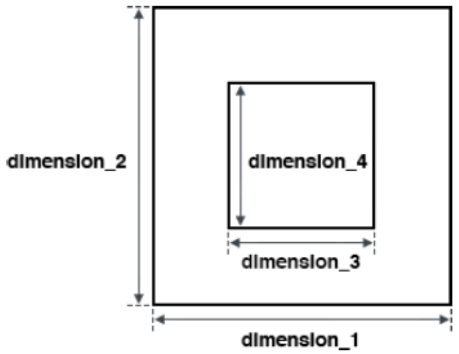












Envelope: General

Azimuth (27)	Decimal
Cardinal Orientation (17)	North South East West
Footprint Shape (28)	Rectangular, square, circular, courtyard, L-shape, U-shape, H-shape, V-shape (?), T-shape, other
Dimension (42)	
Dimension Qualifier	Length, width, height, perimeter, depth
Area (56)	
Area Qualifier	Opaque surface, floor, conditioned floor, unconditioned floor, window, door, operable window
Volume (66)	
Volume Qualifier	Conditioned, unconditioned (Can be calculated if there are enough dimensions)
Air Infiltration Description (216)	Excellent, good, average, poor, very poor (whole envelope ?)
Air Infiltration	Measured value (?) – currently not in any implementation

Envelope: Surfaces

- **Used to be a combination of structural and finish characterizations**

BEDES Beta		
Brick		Masonry
Brick Cavity		Frame Wall
Stone		Frame Wall and Masonry
Concrete - Uncategorized		Curtain Wall
Concrete - Panels		Window Wall
Concrete - Block		Slab Edge
Concrete Poured		Continuous Angle
Concrete Non-Load Bearing		SIPS
Concrete Load Bearing		EIFS and Masonry
Concrete - Insulated Forms		EIFS
Concrete - Aerated		Wood Walls
Metal - Uncategorized		Siding or Shingles
Metal Panels		Other / Combination
Sheet Metal		Unknown

CAST
1. Metal panel / curtain wall
2. Siding on wood frame
3. Brick / Stone on wood frame
4. Brick / Stone on steel frame
5. Brick / Stone on masonry

HPXML
Structural Brick
Stone
Concrete Masonry Unit
Solid Concrete
Steel Frame
Structurally Insulated Panel
Wood Stud
Double Wood Stud
Log Wall
Straw Bale
Other

Envelope: Surfaces

- **Collapsed Wall, Roof, Floor, etc into Opaque Surface**
- **Separated Construction and Finish**
- **Still a few outstanding issues (roof, attic, foundation)**

Opaque Surface (82)	Exterior Wall, Ceiling, Roof, Floor, Foundation Wall, Door (?)
Construction (92)	Masonry, structural brick, stone, concrete (lots), steel frame, wood frame, etc
Finish (111)	Wood, stone, tile, brick, masonry, metal, shingles, etc, carpet, linoleum
Material (133)	Giant list – Currently from different specs – definitive source? ASHRAE?
Material Qualifier (151)	Insulation , framing, construction layer, finish (?)
Exposure (197)	Above ground, below ground, adjacent structure, conditioned space, unconditioned space, partially conditioned space
Component Location (204)	Interior / Exterior
Color (207)	White, light, medium, med-dark, dark
Tilt Description (223)	Flat, Sloped, > 2:12, < 2:12
Tilt Angle (230)	
Framing Factor (177)	
Insulation Application (178)	Loose-fill, batt, spray on, rigid
Insulation Continuity (186)	Continuous, cavity
Insulation Condition (189)	Excellent, good, average, poor

Envelope: Thermal Characteristics

- R-value / U-factor
  - Various implementations have one or the other or both
  - U-factor is for whole assembly, including film coefficients (inside/outside)
  - R-value may or may not be for the whole assembly
    - Used to define insulation only
    - CEC has “effective R-value” which is for whole assembly, includes air films

Envelope: Thermal Characteristics

- **Enough definitions for**
  - **simple audit**
  - **simulation**

Thermal Conductivity (157)
Thermal Conductance
R-Value
R-value per unit dimension
Effective R-Value
Thermal Resistance
U-factor
Density
Specific heat
Solar Absorptance
Thermal Absorptance
Visible Absorptance
Emissivity / Emittance
Roughness

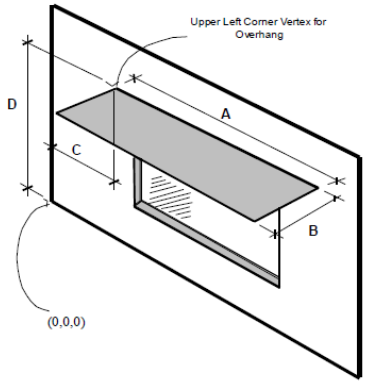
Envelope: Fenestration

Fenestration Type (239)	Window / Skylight / Door / Curtainwall
Fenestration Glass Type	Clear uncoated, tinted, tinted+Low-e, Reflective, Reflective on Tint, Sunbelt Low-e, Suspended Film, Plastic (?)
Fenestration Gas Fill	Air, Argon, Krypton, Other
Fenestration Glass Layer Description	Single-pane, double-pane, triple-pane, multi-layered, single pane with storm panel, other/combination
Fenestration Number of Glass Layers	
Fenestration Frame Type	Aluminum - uncategorized, aluminum – no thermal break, aluminum – thermal break, composite, fiberglass, steel, vinyl, wood, other
Operable windows (287)	Boolean
Window to Wall Ratio (288)	Decimal
Fenestration Layout (289)	Continuous, discrete
Number of fenestration units (294)	
Solar Heat Gain Coefficient (285)	
Visible Transmittance (286)	

Envelope: Fenestration Shading

- **Interior / Exterior Shading Systems**
  - **More detail for simulation than just a list ?**
- **Exterior Fixed Shading**
  - **Detail of CAST**

(use Dimension to define location and size of shades)



Shading System (298)	Overhang
	Fin
	Solar Screen (or just Screen?)
	Screen (different from solar screen?)
	Solar Film
	Louver
	Blind
	Curtain
	Shade
	Light Shelf
	None
	Other

Envelope: Issues

- **Roof** (336)
  - Roof Type – Construction / Finish
- **Attic** (351)
  - Unconditioned, unvented, etc.
  - **Foundation** (354)
  - Type/Ground coupling
    - basement, slab, crawl space, etc
  - **Door**
  - Type:
    - wood (solid/hollow)
    - metal (insulated/uninsulated)
  - **Green Design (?)**
  - Passive Solar
  - Natural Ventilation
  - High-Performance

Measures

- Classification
- Consumption and Savings
- Costs and Financials

Measures: Classification

- Type of Measure
  - Replacement
  - Modification
  - Addition
  - Removal
- Technology Category (1-20)
  - Lighting, HVAC…
- List of measures (AUC, ePB, retuning project)

Measures: Classification

Alternate Approach to describe measures

<Type of Measure>[Replace, Modify, Add, Remove]
<Qualifier>[Pre retrofit]
<System>[Lighting, HVAC….]
<Device>[Fixture..]
<Qualifier>[Post retrofit]
<System>[Lighting, HVAC….]
<Device>[Fixture..]

An example as to how this might work-

Replace- Post retrofit-Lighting-T12 to Post retrofit-Lighting-T8

•Hard to adopt for all the possible measures especially for cases where we do not have the system level information adequately defined.

Measure: Consumption and Savings

- Pre-retrofit and post-retrofit
  - System conditions
    - All the system level variables can be used in conjunction with qualifiers
    - E.g., Pre-retrofit boiler efficiency, post retrofit chiller COP,
  - Consumption
    - Resource + Resource Units + End Use (measure/Project)+Qualifier (pre or post retrofit)+Reading Quality (verified, actual, estimated.)
    - Estimated Pre-retrofit Natural Gas Consumption in therms
    - Verified post-retrofit electricity consumption in kWh

Measure: Consumption and Savings

- Savings
  - Resource Savings
    - Resource and Resource Units (e.g., electricity in kwh.)
    - Interval Frequency (annual, monthly..)
    - Qualifier (weather normalized..)
    - Reading Quality (verified, estimated..)
    - For example *Estimated Annual Electricity Savings in kWh*, *Verified Annual Natural Gas Savings in Therms*
  - Resource Cost Savings
  - Non Resource Cost Savings (O&M, RECs, White tags.)

Measure: Costs and Financials

- Implementation costs
- Periodically Recurring Costs
- Type of Costs
  - O&M, M&V, material, labor, salvage, taxes, insurance..
- Funding Source (capital, operating, loan, tax incentives..)
- Cost effectiveness screening method
- Escalation rates

Generation & Storage Technologies

Update on Recent Changes:

- Discuss how we decided on defining *Generation and Storage Technologies* section
- Expanded and clarified *Generation Technologies* List
- Expanded and clarified *Resource input Type* List
- Continuing to add detail for technology characteristics
  - PV system detail (see spreadsheet)
  - CHP performance characteristics (see spreadsheet)

Controls and Operations

Changes since last time:

- Expanded Operation Event list
- Expanded Setpoint Type list
- Added fields to capture setback configuration
- Added Sensor Type and Sensor Location

Operation Event

- Meals Served
- Laundry Loads
- Ice Performance
- Sporting Event
- Non-Sporting Event
- Procedure
- Class
- Service
- Item Production
- Transaction
- Other Special Event

Setpoint Type

- Room Temp
- Supply Air Temp
- Supply Air Reset Temp
- Outside Air Temp Limit
- Dry Bulb control point
- Enthalpy control point
- Temp lockout
- Water Supply Temp
- Humidity
- Daylight Illuminance
- Pressure
- Speed
- Part Load Ratio
- Part Load Ratio for HGBP
- Other

Sensor Type

- Temperature
- Humidity
- Static Pressure
- Air Flow
- Speed
- Sound
- Flow
- Occupancy
- Vacancy
- Status
- Oxygen
- Carbon Dioxide
- Carbon Monoxide
- Photosensor
- Other Unknown

Sensor Location

- Outside
- Supply Chamber
- Return chamber
- Mixed Chamber
- Duct
- Terminal
- Interior
- Meter
- Other
- Unknown

Overview of Module 2 – Part 2

1. HVAC
2. Process Loads
3. Internal Equipment Loads

- Building Geometry

Overview of Module 2 – Part 2

- HVAC (BEDES 2.4 Beta)
  - Air Distribution
  - Heating
  - Zonal Heating
  - Cooling
  - Zonal Cooling
  - Other HVAC

Overview of Module 2 – Part 2

- **Process Loads (BEDES 2.4 Beta)**
  - Lighting
  - Service Hot Water
  - Conveyance
  - Process Load
  - Pool
  - Other Equipment
  - Water Treatment

Overview of Module 2 – Part 2

- **Internal Equipment Loads (BEDES 2.4 Beta)**
  - IT System
  - Cooking
  - Refrigeration
  - Dishwasher
  - Laundry

BEDES Compliance Overview

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Criteria	Certified Mapping	Compliant Exchange Format
Application	Any Implementation[1]	Software file formats
Map to BEDES terms[2]	Yes	Yes
BEDES Host approves mapping	Yes	Yes, unless developed using BEDES exclusively
BEDES Host approves file format[3]	No	Yes
Public publishing	Optional	Optional
Use "BEDES" in it's product marketing	Optional	Optional
Examples	Mapping of: CEUS, CBECS, Portfolio Manager fields, etc.	*BEDES for Commercial Audits* (AUC), *BEDES for Residential Audits* (HPXML), *BEDES for Energy Data* (Green Button), etc.

[1] Implementation refers to any software application, database, survey, schema, etc.

[2] Not all BEDES terms have to be used, only those that apply. Additional fields that are out of BEDES scope are allowed.

[3] The exchange format does not apply to the database or internal schema, only to files meant to exchange data in or out of the software. May also include a schema, validation rules, etc.